Water

P.E.I.'s MOST PRECIOUS RESOURCE

HILLSBOROUGH RIVER COMPLEX

WATERSHED ACTIVITIES

SURFACE WATER PROGRAM

MARCH 1990

THE CANADA–PRINCE EDWARD ISLAND
WATER MANAGEMENT AGREEMENT

Environment Canada Environnement Canada

Prince Edward Island
Department of the Environment

HILLSBOROUGH RIVER COMPLEX

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WATER MANAGEMENT AGREEMENT

Prepared by:

Environment Canada
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P.E.I. Department of the Environment
Fish and Wildlife Branch

SURFACE WATER PROGRAM

MARCH 1990

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91-00642/

PREFACE

This report is one of a series produced as a result of the Canada - Prince Edward Island Water Management Agreement. The work was performed as part of the Watershed Inventory Project under the Surface Water Program.

It was initiated in order to gain a better understanding of the activities which may impact on the quality and quantity of surface waters drained by the Hillsborough, West and North Rivers into Charlottetown Harbor.

The report is intended to be used in conjunction with the report entitled "Activities Affecting Surface Water Resources · A General Overview" and the book of "Hillsborough River Watershed Complex Inventory Maps", an atlas consisting of a series of mylar overlays, which is maintained on file at Inland Waters Directorate, Environment Canada in Dartmouth, Nova Scotia. All references to maps in this report are to the atlas.

Data collection was performed using the 1:50,000 N.T.S. topographical series. Point data was referenced to the nearest one hundred metres using the Universal Transverse Mercator (U.T.M.) grid system. This mapping technique is also available on diskette which is transferable to the Geographical Information System (G.I.S.) thereby providing an opportunity to update and manipulate the data.

ACKNOWLEDGEMENTS

The co-chairmen of the Surface Water Program Committee would like to thank the following people for their help on this project:

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1.0 INTRODUCTION

In November 1987, the Canada - Prince Edward Island (P.E.I.) Water Management Agreement was signed. The three-year agreement focuses upon several areas including groundwater contamination, stream degradation and estuarine eutrophication. Of these, the Watershed Inventory Project, as part of the Surface Water Program, has b en designed to identify current and future users of P.E.I.'s surface water and to document resource conflicts within twelve watershed complexes across the Island containing twenty-six (26) major rivers. The Hillsborough River Watershed Complex (Figure 1.1), which includes three major rivers (West, North and Hillsborough), was designated as the pilot study area for the project.

2.0 GENERAL CHARACTERISTICS OF HILLSBOROUGH RIVER WATERSHED COMPLEX

2.1 Physiography

The West, North and Hillsborough Rivers each drain a number of tributaries then converge to form Charlottetown Harbour which empties into Hillsborough Bay. Physiographic analysis of the Hillsborough River Watershed Complex has been performed by Inland Waters Directorate of Environment Canada (Taylor, 1988). The Hillsborough River Watershed Complex drains an area of nearly 714 square kilometres through 610 kilometres of streams and rivers.

A physiographic comparison with Prince Edward Island (Figure 2.1) reveals that the percentage of cleared land within the Hillsborough River Watershed Complex exceeds the provincial average. As well, closer examination shows considerable variation within each subwatershed. The North River area has the highest percentage of cleared land (77%) which can be attributed to the extensive subdivision development in the subwatershed.

Charlottetown, located on the shores of Charlottetown Harbour, and its suburbs are the most built-up areas on P.E.I. and contains approximately one-third of the province's population (McInnes, M., 1988). Much of the land near greater Charlottetown is undergoing residential and commercial development. Therefore, lands which once accommodated crops and grazing cattle are now subdivisions. There are numerous other towns and communities located throughout the Hillsborough River Watershed Complex (Maps 11L/2, 11L/3, 11L/6 and 11L/7).

Prince Edward Island is an agricultural-intensive

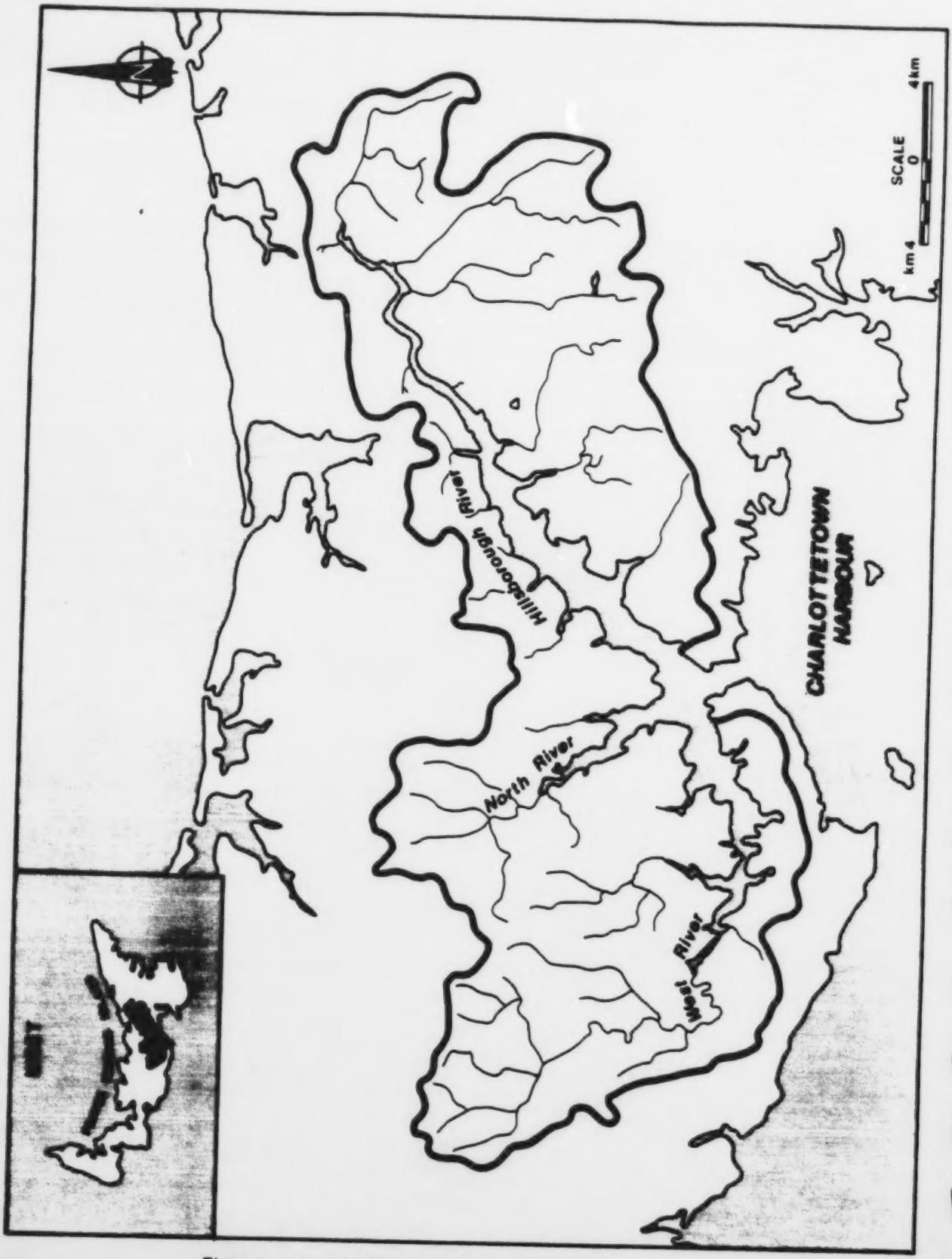

Figure 1.1 Hillsborough River Watershed Complex

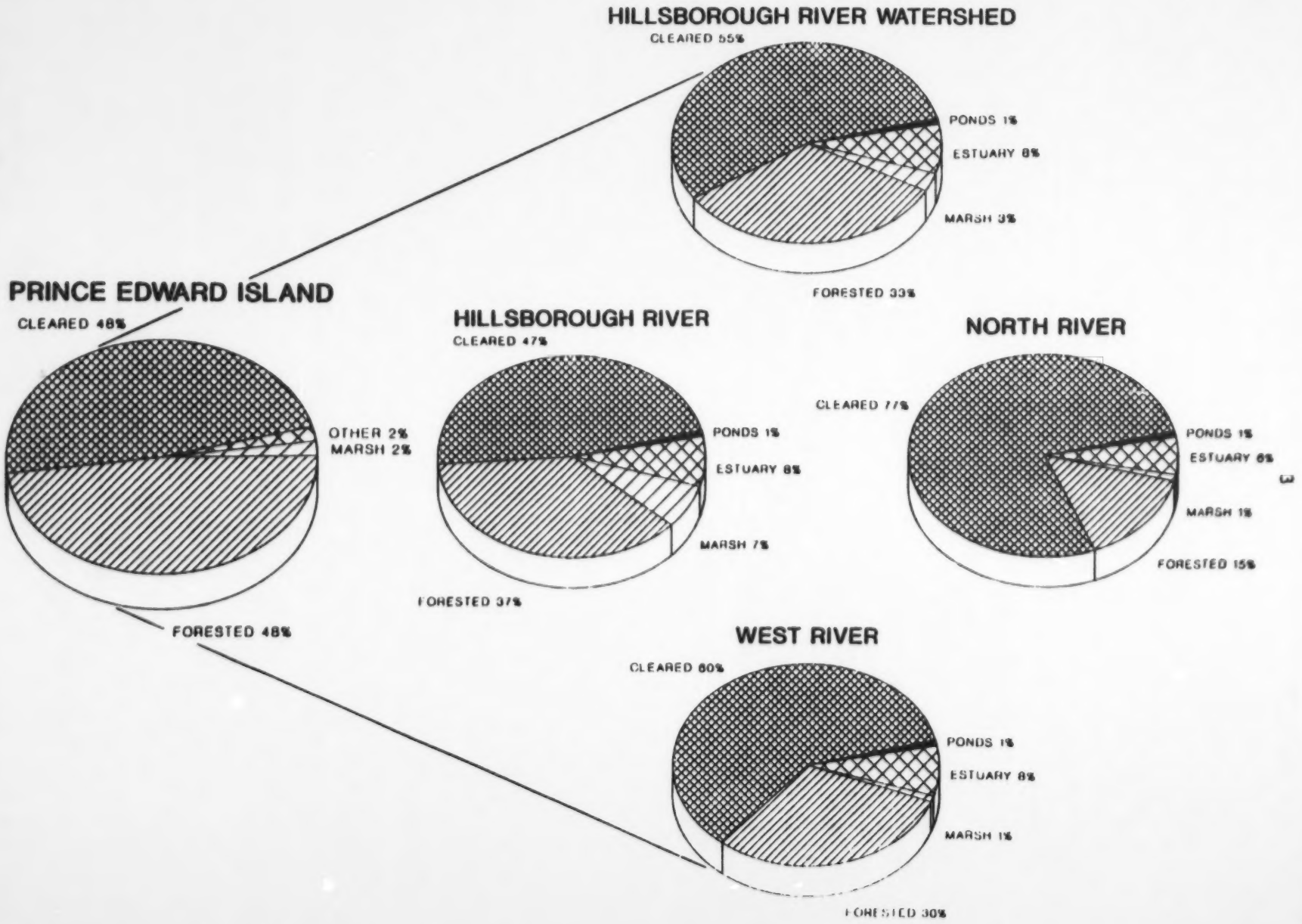

Figure 2.1 Comparison of Physiographic Features (Prince Edward Island and Hillsborough River Watershed Complex)

province with many farming operations present within the Hillsborough River Watershed Complex. The several glaciers which at one time covered the Island have caused a gently undulating terrain across much of the province. All of the lands within the Hillsborough River basin have very gentle slopes (2 - 5%), as do those within the North River subwatershed (2 - 9%), while the lands within the West River subwatershed have strong slopes, moderate slopes and gentle slopes (5 - 30%), (Veer, 1989). Average elevation in the province is less than sixty-one (61) metres above sea level. The West River subwatershed encompasses one of the more hilly sections of the Island with elevations in excess of 114 metres in some areas.

2.2 Soils

Prince Edward Island's podzol soils, formed from both the weathering of rock and the deposition of glacial till, are generally stone-free, sandy and permeable. The Hillsborough River Watershed Complex is composed of varying amounts of Class 0, 2S, 3S, 3T, 4S, 4Ts, 5T, 5W and 7I soils. Approximately fifty-five percent (55%) of the soils within the watershed are Class 2, about ten percent (10%) each are Class 3, 4, 5 and 7, while less than five percent (5%) are Class 0 (Canada Land Inventory, 1968).

3.0 AGRICULTURAL OPERATIONS

Agriculture forms a major part of P.E.I.'s economy. As mentioned, the Hillsborough River Watershed Complex is not well-suited for the large-scale production of potatoes and tobacco. Therefore, most of the agricultural operations within the watershed are livestock in nature. All major livestock operations have been mapped (Maps 11L/2, 11L/3, 11L/6 and 11L/7).

3.1 Dairy Operations

There are one hundred (100) dairy operations located within the watershed (Figure 3.1) each containing thirty (30) or more head (30 milkers plus 30 feeders) of cattle (Dickieson, 1988).

3.2 Beef (Feedlot) Operations

Forty-five (45) beef cattle operations (Figure 3.1) with fifty (50) or more head (50 cattle plus 50 feeders) occur within the watershed's boundaries (Murphy, S., 1988). Twelve (12) are feedlots with each containing 50 to 450 head of cattle.

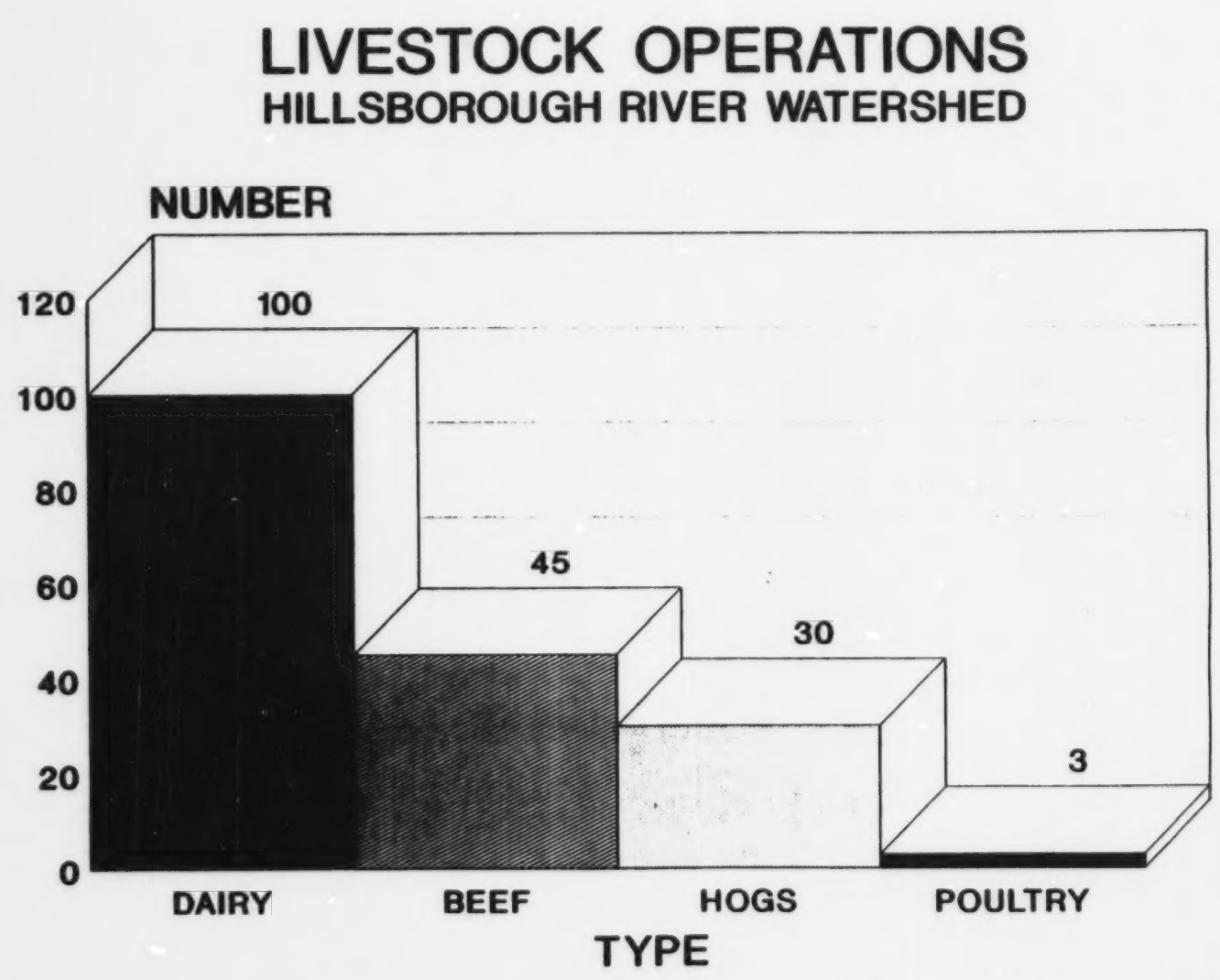

Figure 3.1 Livestock Operations Located Within the Hillsborough River Watershed Complex

3.3 Hog Operations

There are thirty (30) hog operations (Figure 3.1) located in the area. Each has an annual production of 800 or more animals (Jenkins, P., 1988).

3.4 Poultry Operations

There are also three large scale poultry operations (Figure 3.1) located within the Hillsborough River Watershed Complex (Newson, 1988).

3.5 Stock Watering

Most P.E.I. livestock, including those contained in feedlots drink groundwater which is piped into troughs (Murphy, S., 1988). However, during fieldwork, cattle and hogs were observed drinking from the streams and rivers traversing pastures. This activity results in bank erosion and sedimentation and leads to deterioration of fish habitat. Surface waterways, especially estuarial portions, are also deleteriously affected by increases in bacterial levels and nutrient loading due to wastes voided by livestock while in or near the streams.

3.6 Irrigation

The Prince Edward Island Department of Agriculture does not keep specific records on irrigation within the province although there is knowledge of one agricultural operation in the watershed (Fort Augustus) which is known to employ irrigation during the growing season for fruit and vegtable crops (Clough, 1988). The number of farmers who irrigate their crops increases considerably during periods of dry weather. Therefore, this activity should be monitored so as to maintain adequate levels for fish, wildlife and other users.

3.7 Dead Stock Burial

There are no commercial dead stock burial sites located within the Hillsborough River Watershed Complex. Farmers may either pay a service fee to have their stock discarded at an approved disposal site, sell their dead animals to Maritime Pet Foods (located in Hunter River) or dispose of them on their own property.

3.8 Manure Storage and Disposal

Since there are a large number of livestock operations contamination of surface waters is likely. Bacterial contamination of the water has resulted in the closure of

estuarial areas to shellfish harvesting.

3.9 Erosion Control Projects

There are a total of sixty-two (62) erosion control projects within the Hillsborough River Watershed Complex. Of these, fifty-eight (58) are tile drainage projects (Table 3.1).

Table 3.1 Erosion Control Projects Within Hillsborough River Watershed Complex

TYPE	HILLS.	WEST	NORTH	TOTAL
Tile Drainage	5	16	5	58*
Diversion Ditch	-	1	-	1
Surface Ditch	1	-	-	1
Open Ditch	-	-	1	1
Grassed Waterway	1	-	-	1
TOTALS	7	17	6	62*

* Includes systems which were installed prior to the initiation of Agriculture Canada's Soil and Water Conservation and Management Program in June 1984.

Thirty-two (32) tile drainage systems were installed prior to Agriculture Canada's Soil and Water Conservation and Management Program (Brown, 1988). The exact locations of these particular systems are unavailable. Since the Soil and Water Conservation and Management Program was initiated in June 1984 there have been an additional twenty-six (26) tile drainage systems installed (1987 figures). The projects range in length from 238 metres to approximately 10,000 metres.

There are also four additional types of erosion control projects located within the Hillsborough River Watershed Complex.

4.0 FISH AND WILDLIFE RESOURCES

Fish and wildlife play an important part in the recreational lives of both residents and tourists, alike on

Prince Edward Island. The large rivers and their tributaries constitute extensive habitat for fish and wildlife which leads to spin-off benefits for outfitters, owners and operators of motels, restuarants and gas stations.

4.1 Angling Areas

Twenty-nine (29) angling sites were delineated within the Hillsborough River Watershed Complex (Maps 11L/2, 11L/3, 11L/6 and 11L/7) including twenty (20) listed in the publication Angling on Prince Edward Island (P.E.I. Department of Tourism and Parks, 1988). The remaining sport fishing areas were outlined by the P.E.I. Fish and Wildlife Branch conservation officers responsible for patrolling and enforcing game laws within the area (Hurry, 1989).

4.2 Hunting Areas

The conservation officers delineated twenty-four (24) areas, varying in size, as hunting locales within the Hillsborough River Watershed Complex (Maps 11L/2, 11L/3, 11L/6 and 11L/7). In keeping with the migratory habits of wildlife, in response to food availability and other habitat requirements, these areas have no rigid boundaries and are therefore not static.

4.3 Trapping Areas

As with hunting areas, the twenty-six (26) trapping areas located within the watershed (Maps 11L/2, 11L/3, 11L/6 and 11L/7) do not have consistent boundaries from year-to-year. These boundaries are dependent upon both the movement of the animals and the preferences of trappers. Species trapped in these areas include beaver, muskrat, raccoon and fox.

4.4 Beaver Activity Areas

There are twenty-three (23) active beaver dams (Map 11L/7) located within the watershed (Dibblee, 1988). Most of these occur in the Hillsborough River subwatershed. These areas are often not consistent from year-to-year due to mortality and the active removal of problem dams by Fish and Wildlife Branch personnel.

5.0 RECREATIONAL ACTIVITIES

Surface water and some recreational activities go hand-in-hand (swimming and boating). Other activities (hiking and skiing) are often enjoyed in close proximity to streams and rivers. Similarily, major recreational facilities (provincial parks and campgrounds) are generally adjacent to

Island surface water resources.

5.1 Provincial Parks / Private Campgrounds

There are four provincial parks located within the Hillsborough River Watershed Complex (Maps 11L/3, 11L/6 and 11L/7). Brookvale, operational only during the winter, offers such activities as downhill skiing, cross-country skiing and tobogganing. Both Bonshaw and Mount Stewart Provincial Parks are day-use areas, containing picnic facilities only, while Strathgartney Provincial Park provides complete campground sites and facilities.

There are also three private campgrounds in the area (Maps 11L/3). Southport Trailer Park (near Charlottetown), Holiday Haven (near Cornwall) and Dunollie Travel Park (near Fairview) offer such recreational activities as swimming, boating, boardsailing and clam digging (P.E.I. Department of Tourism and Parks, 1988).

5.2 Swimming Areas

Generally, people will swim where they desire. In P.E.I., many of the best swimming areas are coastal. This, therefore, excludes most of the Hillsborough River Watershed Complex.

However, some of the inland areas used by swimmers Graham Rogers Lake, Glenfinnan Lake, the estuarial portions of the Hillsborough, West and North Rivers, Dunollie Travel Park, Holiday Haven Campground and Southport Trailer Park (Maps 11L/3, 11L/6 and 11L/7).

5.3 Boating / Canoeing Areas

Sites available for boating and/or canoeing within the Hillsborough River Watershed Complex are often based upon the level of recreational activity preferred and the location of suitable access points. Two of the most frequented boating areas within the Hillsborough River Watershed Complex are located at Cornwall Pond and Hatchery Pond (Maps 11L/2, 11L/3, 11L/6 and 11L/7). The estuarial portions of all three major rivers are also excellent boating areas.

The Prince Edward Island Recreational Canoeing Association (PEIRCA) is able to provide additional information on various canoeing routes throughout the province but does not offer any organized trips (P.E.I. Department of Tourism and Parks, n.d.). Canoeing is popular within the Hillsborough River Watershed Complex with many put-in and take-out points located along the North, West and Hillsborough Rivers (Maps 11L/2, 11L/3, 11L/6 and 11L/7).

The Canadian Red Cross Society sponsors an Annual Multi-Sport Relay Race during the late spring. It has a canoeing leg covering a distance of approximately five miles along the West River (Map 11L/3). In 1989, approximately 190 teams participated in the race.

Canoe rentals are available at Graham Rogers Lake which is located on the north side of the North River Causeway. Good boating and canoeing opportunities are also available on the Lake.

Boardsailing (windsurfing) is gaining popularity on P.E.I. Charlottetown Harbour and Graham Rodgers Lake are two locations within the Hillsborough River Watershed Complex which are most often used for this purpose. Dunollie Travel Park and Holiday Haven Campground are also open to boardsailors (Maps 11L/3, 11L/6 and 11L/7).

A marina with a capability for accommodating larger boats (sailboats and yachts) is located on Charlottetown Harbour. Presently, there are plans for expansion which are to include docking facilities for 150 boats (Hume, 1988).

5.4 Hiking / Cross-Country Skiing / Snowshoeing

For the nature buff or recreational enthusiast a good method in which to see an area is on foot either by hiking, cross-country skiing or snowshoeing. In this way, people can go at their own pace, perhaps photographing what catches their eye or just enjoying the great outdoors.

A hiking trail passes through Bonshaw Provincial Park in the West River subwatershed (Map 11L/3). It begins on Highway #9 near St. Catherines and zig-zags its way through the Park to Crosbys Mills. Next, it winds its way through woodlands and along Greens Brook ending at the Green Road which is just beyond the western boundary of the West River subwatershed. Other hiking trails, although not as long as the Bonshaw Trail, are located within the P.E.I. Department of Energy and Forestry Demonstration Woodlots at Auburn and Brookvale, Royalty Oaks Natural Area and the Hillsborough Hospital (Map 11L/6).

Cross-country ski trails are located in the demonstration woodlots and at Brookvale Provincial Park. An additional trail is at Victoria Park in Charlottetown. Abandoned rail lines and woods' roads also provide for good cross-country skiing opportunities.

Snowshoeing may be undertaken anywhere although the areas utilized for hiking and cross-country skiing most likely have

the highest use for snowshoers as well.

5.5 Snowmobiling / Horseback Riding

There are not any snowmobiling clubs located within the Hillsborough River Watershed Complex and therefore no organized excursions. Snowmobilers are often observed riding through fields and along woods' and seasonal roads. During the annual Charlottetown Winter Carnival snowmobile drag races are held on Graham Rogers Lake.

There are no commercial horseback riding operations located within the Hillsborough River Watershed Complex. There have been horses noted in several pastures and it is assumed that recreational horseback riding does occur on a limited scale within the watershed.

5.6 Unplowed (Seasonal / Scenic Heritage) Roads

Many local and unpaved roads within the watershed are not kept open for vehicular traffic during the winter (Maps 11L/2, 11L/3, 11L/6 and 11L/7). Many of these roads are not adequately ditched. Therefore, sedimentation (siltation) to surface waters can be compounded during periods of heavy rain or spring runoff.

The relative abundance of these roads provides excellent venues for winter recreational activities such as cross-country skiing, snowshoeing and snowmobiling. Often not well travelled even during the warmer months these roads may further supply recreational opportunities for hiking, cycling and horseback riding.

Four roads in the watershed have been designated as Scenic Heritage Roads (Maps 11L/3 and 11L/6) as a result of their natural and historical significance (Horne et. al., 1988).

5.7 Golf Courses

During the summer months many Island golf courses water their greens and tees on a regular basis. Water used for irrigation purposes is either drawn from either a groundwater or surface water source.

There are two golf courses located within the Hillsborough River Watershed Complex (Maps 11L/3 and 11L/6). The Belvedere Golf and Winter Club, located in Sherwood, is irrigated using the City of Charlottetown water supply (groundwater). The Strathgartney Golf and Driving Range, located in Strathgartney is also irrigated using groundwater.

6.0 FISHERIES OPERATIONS

The fisheries industry is very important economically to Prince Edward Island. All of the major watersheds have an estuarial component with most supporting a fishery to some extent. All finfish and shellfish harvesting which takes place can be placed into three general categories, namely: licensed commercial, non-licensed commercial and recreational and finfish aquaculture.

6.1 Licensed Commercial

As of July-August 1987, there were sixty-six (66) oyster (bottom) leases, sixteen (16) mussel conditional leases, three mussel leases, one mussel conditional permit for seed collection and two finfish culture leases (Maps 11L/3, 11L/6 and 11L/7), (Small, 1988).

While not officially licensed, smelt fishery "berths" are registered with the Department of Fisheries and Oceans. During the 1987 season a total of eighty-eight (88) "berths" (Maps 11L/3, 11L/6 and 11L/7) were identified within the Hillsborough River Watershed Complex (McInnis, R., 1988).

6.2 Non-Licensed Commercial / Recreational

The most recent estuarine inventories completed for the North River (Campbell et. al., 1972) and the Hillsborough River (MacWilliams and Judson, 1973) provide detailed information concerning the occurrence and relative abundance of all shellfish species. Accompanying maps identified significant distributions of mussels, soft-shelled clams, oysters and quahogs throughout both estuarine systems. A similar study was carried out on the West River (circa 1968-1970) but this reference could not be located.

Despite the closure of large portions of all three estuaries due to bacterial contamination (Maps 11L/3 and 11L/6) the West, North and Hillsborough Rivers currently support significant non-licensed commercial and recreational finfish and shellfish harvests. The shellfish which are removed from the contaminated areas are transferred to unpolluted areas for flushing (a period of three to four weeks). However, people who harvest shellfish from contaminated areas must first obtain a conditional permit from the Department of Fisheries and Oceans. The value of fish and shellfish landed at Charlottetown in 1987 was approximately one million dollars (Figure 6.1). The areas of greatest shellfish concentration (Maps 11L/3 and 11L/6) within the three major estuaries have also been identified (Morrison, 1988).

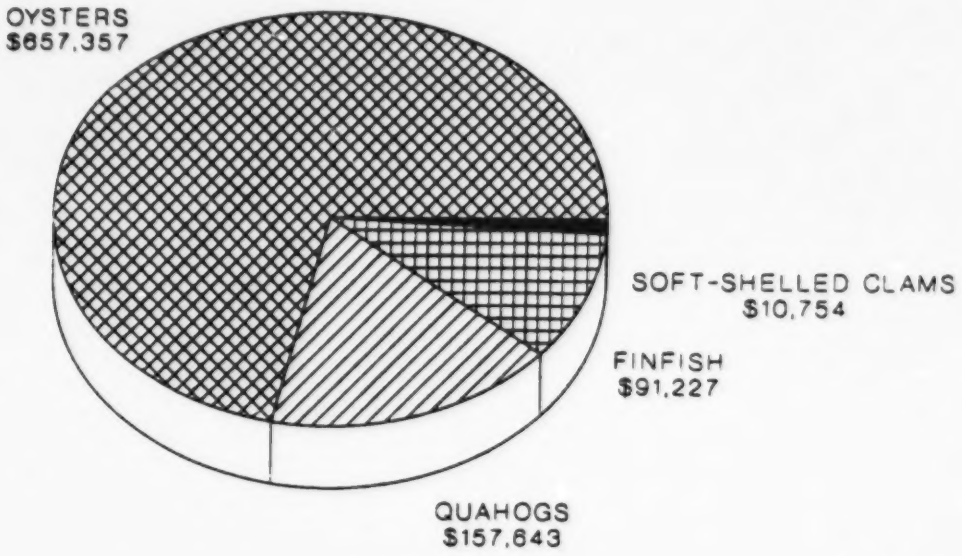

Figure 6.1 Hillsborough River Watershed 1987 Fish/Shellfish Landings

6.3 Finfish Aquaculture

During the past several years finfish aquaculture has gained considerable momentum on Prince Edward Island. As noted earlier, there are two aquatic finfish leases located within the watershed.

In addition, two land-based aquaculture operations are producing rainbow trout. The Brookvale Hatchery (Map 11L/6) has the capacity to produce in excess of 250,000 fingerlings. Source water is a mixture of groundwater and surface water from the upper reaches of the West River. The operation design utilizes a water re-use system and provides for an accumulation of wastes. No waste retention pond exists or is planned.

The second operation, located at Tarantum (Map 11L/7), became operational during the autumn of 1987 and has about 1000 fish. Source water is from a spring but further plans are to include withdrawal of water from the Glenfinnan River, a major tributary of the Hillsborough River. At present, wastewater is discharged into a ditch holding area but plans call for the construction of a full retention pond.

7.0 INDUSTRIAL OPERATIONS

Many of the industrial operations on Prince Edward Island

either have a direct or indirect effect on surface water resources. Some discharge both treated and untreated wastes directly into streams and rivers, while others allow for the seepage of pollutants to surface or groundwater sources. Some industrial operations require surface water resources for their processes.

7.1 Stormwater Drainage Systems

The City of Charlottetown is served by an extensive storm system which connects with the Charlottetown Area Pollution Control Center (CAPCC). East Royalty, West Royalty, Sherwood, Parkdale and Hillsborough Park are also served by this network.

A portion of the Charlottetown area is serviced by a combined sewer system, that is, sanitary sewage and stormwater are collected in the same pipe. The CAPCC facility is able to treat three times the normal dry flow of stormwater for later release into the Hillsborough River. Average daily treatment volumes of domestic-industrial-stormwater waste is 15.9 million liters (3.5 million gallons). The daily capacity of the CAPCC is five million gallons. During periods of high flow, excess sanitary sewage and stormwater is not treated by the CAPCC and discharges directly into Charlottetown Harbour and North River via several outlets (Hiscock, 1989).

Cornwall has a small stormwater system serving the Highway #1 area. Two outlets exit into Hydes Creek.

North River has a small existing stormwater drainage system serving the Highway #1 area and is adding an extension. The storm sewer system exits into the North River.

A stormwater system follows Route #21 in Bunbury entering to the Hillsborough River near the Bunbury Nursery.

Stratford Road in Southport is also serviced with two outlets exiting into Charlottetown Harbour.

The Village of Mount Stewart maintains two stormwater outlets which discharge into the Hillsborough River.

For all of these communities, stormwater is neither monitored nor treated.

7.2 Sewage Treatment Plants / Lagoons

In addition to the Charlottetown Area Pollution Control Center which provides sewage treatment for the Greater

Charlottetown area, smaller treatment facilities and/or lagoons service many communities and mobile home (trailer) courts within the Hillsborough River Watershed Complex.

Ten sewage treatment plants/lagoons have been identified (Maps 11L/3, 11L/6 and 11L/7). Effluent entering the treatment facilities is domestic in origin except for Island Breweries (commercial) and the CAPCC (domestic-commercial-storm sewer).

The CAPCC facility is a primary treatment plant which treats waste in stages. When the sewage first enters the plant, it passes through a grit trap which is designed to remove solids so as not to damage the equipment. The grit classifier stage dewaters the separated grit which is then hauled to a landfill. The waste then passes through a bar screen where larger objects are removed, then enters the primary sedimentation tanks (solids settle and are passed to the methane digestor). The liquid is treated with chlorine during the summer months before being flushed into the Harbour at acceptable biological oxygen demand (BOD) and fecal coliform levels. Chlorine is not added to the effluent during the winter months (Van Omme, 1988).

The other sewage treatment facilities which are located within the Hillsborough River Watershed Complex are either aerated or non-aerated lagoons in which the solids settle to the bottom. Before the resultant liquid from these lagoons is drawn off (seasonally), it must be tested to ensure that the BOD and fecal coliform counts are at acceptable levels for the receiving waters (Reeves, 1988).

7.3 West Royalty Industrial Park

The West Royalty Industrial Park (Map 11L/6) contains about forty (40) businesses which fall into three broad categories, namely; light/secondary manufacturing, professional services and food processing. Water is sourced from three wells, two of which are operational at any one time.

Sewage/waste water is directed to the West Royalty sewer system which forwards it to the CAPCC. All businesses in the Park are governed by contracts which control both the amount and nature of substances which may be discharged into the sewer system (Jenkins, K., 1988). For example, Diagnostic Chemicals, a manufacturer of chemical analysis kits, disposes of small amounts of dilute solvents into the sewer system. However, the P.E.I. Public Utilities Commission (P.U.C.) has established sewage regulations as part of its mandate for approving sewage rates for the various municipalities. A list of prohibited substances which cannot be discharged into

a sewer is included in the regulations. The P.U.C. regulations are a mandatory requirement and have priority over any agreements between industry and the CAPCC (Hiscock, 1989). Toxic concentrations of chemicals or materials containing heavy metals are either incinerated or trucked away for proper disposal (O'Connell, 1988).

7.4 Maritime Electric Company Limited

Maritime Electric Company Limited's (Map 11L/3) oil-fired generating plant operates on a "closed loop" system which uses water from Charlottetown Harbour to cool steam after it passes over generating turbines. At full capacity the cooling system passes 265,500 litres (59,000 gallons) per minute through the "loop". It rarely operates at these levels since less expensive electricity is available from off-Island sources. The plant operates at about fifteen percent (15%) of its annual capacity (twelve percent (12%) from December to March and three percent for the balance of the year), (McDermott, 1988).

Since it is a closed system the danger of chemical or organic pollution to Charlottetown Harbour is minimal. However, the water which is used undergoes an increase in temperature of eleven degrees Celsius and is discharged into Charlottetown Harbour (Lea, 1988). At full capacity this represents sixty-nine (69) megawatts of thermal energy which acts to keep a portion of the Harbour ice-free during the winter. The open water is subsequently used by waterfowl as a resting and feeding area as most other nearby locations are frozen over.

7.5 Food and Beverage Industry

The watershed does not have an abundance of food and beverage industries which require a large supply of water for their processing. Some contaminate surface water resources as a result of their discharges.

7.5.1 Seaman's Beverages

Seaman's Beverages, located in the West Royalty Industrial Park (Map 11L/6), constitutes a pollution source to Graham Rogers Lake, a highly used recreational area. The water used to pre-rinse and wash pop bottles drains untreated into the lake at a rate of nearly 135 litres per minute. The discharge has a high biological oxygen demand and total coliform count (Appendix A) and contributes significantly to the eutrophication of the receiving water body (Reeves, 1988).

7.5.2 Island Breweries

The Island Breweries' facility (Map 11L/6) channelled all of its waste and waste water into a holding pond located on the property. In summer, the pond was totally anaerobic and odor problems had been associated with a high BOD and organic loading. The influence of the lagoon on the North River was unknown. The business has since ceased operations.

7.5.3 Garden Province Meats

This slaughter house/packing plant (Map 11L/6) produces an estimated 450,000 litres (100,000 gallons) of waste/waste water per day. A primary clarifier, located on-site, removes the suspended solids prior to the effluent being discharged to the Sherwood sewer system and then taken by a trunk sewer system to the CAPCC for additional treatment. A mechanical scraper, located in the clarifier, collects all of the solids to a hopper. The solids are then pumped into a large metal container and taken for disposal at an off-Island site (Hiscock, 1989).

7.6 Abandoned, Active and Unapproved Dump Sites

During 1982-83 the P.E.I. Department of Community and Cultural Affairs, in conjunction with Environment Canada, performed a study in which abandoned, active and unapproved waste disposal sites on Prince Edward Island were located and inspected (Water Resources Branch, 1983). Of prime concern during the inventory was the potential for groundwater contamination. Eighty-five (85) sites were identified within the Hillsborough River Watershed Complex (Maps 11L/3, 11L/6 and 11L/7).

As part of the inventory, a scoring system was devised and used to rate and priorize (Priority I, II or III) each site on the basis of actual and potential environmental effects. Priority I sites were rated as being most hazardous to the environment; Priority II dumps were less hazardous; while Priority III sites were generally very small discriminate sites which were not considered to be environmentally hazardous. Evaluation of the dumps revealed three Priority I, twenty-five (25) Priority II and fifty-four (54) Priority III sites. An additional three dumps did not receive a priority rating during the inventory.

The Air and Solid Wastes Branch, P.E.I. Department of the Environment, has identified one bulk landfill, one local dump, one container site and an enclosed incinerator site as active approved dumps in the watershed. A second bulk landfill, located in East Royalty, has been relatively

inactive for about two years. It was reopened in Feburary 1988 for the disposal of lightly contaminated soil (1% by weight) which was obtained as a result of the cleanup of an abandoned bulk fuel storage site (Stewart, 1988).

There is no established program for hazardous waste disposal on Prince Edward Island (Curley, K., 1988). The Air and Solid Wastes Branch cooperates with their Federal counterparts in controlling toxic waste disposal.

The only major forms of toxic wastes on P.E.I. are polychlorinated biphenols (PCB's) and agricultural chemicals. PCB's do not break down under normal conditions so they must be stored until they can be transported to a proper disposal site located off-Island. Although most of the PCB's on P.E.I. are in storage awaiting disposal there are some that are still in use (Table 7.1).

7.7 Excavation Pits

Scattered throughout the Hillsborough River Watershed Complex are numerous excavation pits used for the private and commercial removal of sandstone and to lesser amounts, gravel and sand. There are a total of twenty-three (23) registered active excavation pits (Maps 11L/3, 11L/6 and 11L/7). Records are not kept concerning the quantity of material removed from individual pits. There are also other pits for which permits have not been obtained as well as several which have been abandoned over the years (Murphy, C., 1988).

7.8 Salt / Sand Storage Locations

The P.E.I. Department of Transportation and Public Works maintains a number of salt/sand storage areas across the Island which they use to control ice buildup on roads during the winter. Often their locations change annually, thereby yielding both abandoned and active sites. Three active (Charlottetown, Fort Augustus and North Wiltshire) and one abandoned (Dromore) site have been identified (Maps 11L/3, 11L/6 and 11L/7).

In addition to providing protected housing for salt storage, the Charlottetown depot also serves as a mixing area for salt/sand that is transported to local sites. At these secondary locations the salt/sand mixture is stored directly on the ground with little or no site preparation.

7.9 Snow Dumping Sites

The majority of snow removed from Greater Charlottetown streets is dumped directly into Charlottetown Harbour from the Railway Wharf. A vacant land area near John Street in

Table 7.1 PCB's Within Hillsborough River Watershed Complex

COMPANY	QUANTITY (LITRES)	LOCATION
(In storage)		
CBC	4	Bonshav Transmission Station
Charlottetown Water Commission	15	Charlottetown
CAPCC	46	Charlottetown
CHTN Broadcasting	2	Rocky Point
H.W. MacLaughlan Ltd.	377 (low level)	Charlottetown
Maritime Electric	364 (pure)	Charlottetown
Company Limited	3,483 (mineral oil)	
Nevson Electric	10	Charlottetown
Transport Canada	75	Charlottetown
Dominion Building	2 drums of ballasts	Charlottetown
SUBTOTAL	**4,376**	
(In use)		
CBC	2	Bonshav
CEGP	682	Parkdale
Confederation Center	819	Charlottetown
Sullivan Building	818	Charlottetown
UPEI	3,600	Charlottetown
SUBTOTAL	**5,921**	
TOTAL	**10,297**	

* Re: The Guardian - Patriot, 1988.

Charlottetown serves as a second disposal site during periods of peak removal. Melt water from this site travels into the stormwater disposal system to exit either into Charlottetown Harbour or North River or to be treated at CAPCC. A third disposal site, located on North River Road adjacent to Ellens Creek, creates runoff and siltation problems (see Section 11.1.6), (Maps 11L/3 and 11L/6).

8.0 ALTERATIONS OF NATURAL FEATURES OF WATERWAYS

Individuals or groups wishing to alter the natural features of a waterway directly or indirectly to improve the recreational potential, to provide a reservoir for agricultural purposes or fire protection or to construct a stream crossing must seek approval from the Watercourse Alteration Advisory Committee.

8.1 Application Process and Requirements

Alteration applications are subject to government control under the P.E.I. Environmental Protection Act (Section 10) and the Canada Fisheries Act (Chapter F-14, Section 20). Before requests are given final approval by the Head of the Watercourse Alteration Advisory Committee, they are reviewed by several Federal/Provincial government and private agencies. Once approval is granted, inspections are carried out to ensure that the recommendations of the Committee are being properly followed.

Application considerations include the following criteria: the well-being of the fishery resource (primary); possible changes in water quality; stream-side cutting leading to loss of essential food and cover; and the effects of the alteration on other types of wildlife.

Types of alterations include, but are not limited to; the installation of dams and/or fishways, roadway culvert installation, rock gabion installation and the infilling of marshes. Infilling applications are usually rejected since the practice results in a loss of wildlife habitat.

Since P.E.I. soils are highly susceptible to erosion, proponents who alter waterways must undertake adequate erosion control measures throughout the course of the project.

8.2 Dam Inspections

Most of the ninety-eight (98) dams located in the watershed (Maps 11L/2, 11L/3, 11L/6 and 11L/7) were inspected. Fifty-six (56) of the dams are found within the

Hillsborough River subwatershed, thirty-two (32) within the West River subwatershed and ten (10) in the North River subwatershed. Results of the inspections are found in Appendix B. Some were found to constitute a complete barrier to fish passage. The reasons for this were determined to be due to the design or breakdown of the dams or debris buildup within the waterways. Some dams were determined to be a barrier to some species of fish while other dams were breached (washed out).

8.3 Fishways

On Prince Edward Island, whenever an alteration is made to a waterway, the continued passage of fish must be ensured [Canada Fisheries Act, Chapter F-14, Section 20 (1)]. This involves, in some cases, the construction of a fishway. Various fishway designs are used with the type installed dependent upon the species of fish to be passed and the water level fluctuations within the impoundment.

Fourteen fishways were identified and field-checked (Maps 11L/3, 11L/6 and 11L/7) including twelve pool-and-weir (ranging from three to nine step) and two Denil. All were found to be in good condition.

8.4 Road - Stream Intersections

The P.E.I. Department of Transportation and Public Works maintains a reference map which provides an up-to-date record of all major highway structures, that is, those over 1.2 metres in diameter, within the province. The Hillsborough River Watershed Complex contains 106 such structures (Maps 11L/2, 11L/3, 11L/6 and 11L/7).

The Watershed Inventory Project also identified 115 additional road - stream crossings which, due to their smaller size, are not kept on file at the Department of Transportation and Public Works (Maps 11L/2, 11L/3, 11L/6 and 11L/7). These areas were located via 1:50,000 N.T.S. maps but have not been field checked due to time and manpower constraints.

There are, in some cases, repairs made to design flaws of roadway culverts which then permits the passage of fish through the structures. This involves the installation of baffles which then allows for decreased flows and increased depths within the culverts.

8.5 Railway - Stream Intersectons

Earlier this century, railroads on Prince Edward Island were a vital component in the transportation of goods across

the Island. However, due to increased rail costs and more efficient trucking methods its importance is rapidly decreasing. Therefore, all lines across the province were phased out and in January 1990, the lines were abandoned.

Once the line is abandoned, CN Real Estate contracts out for the removal of the ties and rails. Crossing structures are not usually removed since they are often more useful if left in place. However, they may cause problems over the long run if they are not maintained.

The rail lines incorporate twenty-two (22) stream crossings (Maps 11L/2, 11L/3, 11L/6 and 11L/7).

9.0 WETLANDS

Wetlands include salt marshes, intertidal flats, bogs, freshwater marshes, swamps and ponds. They are important for many reasons:

1. wildlife habitat;
2. act as natural filters;
3. bind pollutants, thereby slowing the eutrophication process;
4. reduce flooding by acting as reservoirs; and
5. recharge the groundwater supplies.

During 1983 - 84 wetlands over 0.25 hectares within the Hillsborough River Watershed Complex were inventoried as a result of a joint project between Canadian Wildlife Service, P.E.I. Fish and Wildlife Branch and Ducks Unlimited Canada. The objective of the project was to provide information on the classification, size, distribution and wildlife value of all wetlands based on a wide array of parameters (Canadian Wildlife Service, n.d.).

9.1 Freshwater Wetlands

All freshwater wetlands were identified during the aforementioned inventory and were given a value. The wetlands received a score between 36 and 108 with a score of 60+ indicating generally more productive areas.

A total of 109 freshwater wetlands with a score of 60+ were delineated in the watershed (Table 9.1), (Maps 11L/2, 11L/3, 11L/6 and 11L/7).

Table 9.1 Wetlands Within Hillsborough River Watershed Complex

SUB-WATERSHED	FRESHWATER	COASTAL	TOTAL
Hillsborough	62	80	142
West	27	31	58
North	20	11	31
TOTAL	109	122	231

9.2 Coastal Wetlands

Coastal wetlands were classified and scored as coastal units during the Inventory. The coastal unit score was calculated using the total of the scores from six component types of wetlands, along with five additional factors and added to that was a value for the disturbance status of the unit. The total coastal unit score indicated its productivity and provides a measure of its importance to wildlife. The scores ranged from 10 to 1500 points and were indicated as the sum of all wetlands within the unit.

One hundred and twenty-two (122) coastal wetlands were identified in the Hillsborough River Watershed Complex (Maps 11L/3, 11L/6 and 11L/7), (Table 9.1).

9.3 Ducks Unlimited Canada Management Sites

Ducks Unlimited Canada is active on Prince Edward Island in the preservation and enhancement of wildlife habitat. Several types of management techniques are employed for this purpose. Installation of water control devices such as drop inlets and stoplog control structures allow for the creation of ponds and the regulation of water levels in order to maintain optimal habitat conditions. Fishways are usually

required to be installed with the water level control structures in order to allow for the continued passage of fish into and out of the impoundment.

There are nineteen active Ducks Unlimited projects in the Hillsborough River Watershed Complex (Maps 11L/2, 11L/3, 11L/6 and 11L/7). They range in size from the 2.8 hectare site at Carraghers Pond to the 242.9 hectare ditching project along the Hillsborough River near Mount Stewart (Table 9.2).

10.0 ADDITIONAL WATERSHED ACTIVITIES

10.1 Hydrometric Stations

During the period April 1976 to March 1979, the Water Quality Branch of the Inland Waters Directorate, Environment Canada maintained a hydrometric station (NAQUADAT No. 01CC004) at Wrights Creek near Andrews Pond. However, as the drainage area for this station is small (2.20 km^2) and the flow/discharge information was only recorded for a three-year period, the site is of little value for hydrologic interpretation.

In addition, two natural flow/manual gauging stations were established in 1986 by the Environmental Management Division, P.E.I. Department of Community and Cultural Affairs as part of a West River estuarial study (Map 11L/3). The first of these (NAQUADAT No. 01CC005) was located on the West River near Riverdale and the second (NAQUADAT No. 01CC006) on the Clyde River near Clyde River. Random daily discharge, temperature and pH data are available for 1986 only.

Land use characteristics for the basins draining to each of these stations have been determined and appear in Table 10.1 (Taylor, 1988).

In addition, the Water Quality Branch, Inland Waters Directorate, Environment Canada, Moncton New Brunswick also maintains somewhat limited data associated with the following studies:

- P.E.I. Groundwater Study (May 1972 - September 1973);
- P.E.I. Surface Water Quality Survey (July 1972);
- Water Quality Board National Water Quality Monitoring (April 1974 - March 1978);
- Charlottetown Airport Expansion Study (September 1976 - 1985); and the
- Toxic Chemical Survey (1985).

Parameters monitored included the following: major ions, physical parameters, nutrients, metals and toxic substances.

Table 9.2 Ducks Unlimited Management Sites Located Within Hillsborough River Watershed Complex

NAME	SIZE (ha)	SHORELINE (km)	YEAR COMPLETED
Johnstons River	111.2	8.8	1971 & 1986
Dromore I	20.2	5.9	1973
Dromore III	8.1	1.6	1976
Glenfinnan I	10.1	1.6	1976
Hornes Creek (3 ponds)	12.9	4.8	1976 - 78
Hughes Pond	2.4	0.8	1977
Clarks Brook	4.9	1.3	1977
Mt. Stevart Marsh	242.9	10.6	1978
Jenkins Complex	55.4	12.9	1978 - 83
Fullertons Marsh	13.4	3.2	1980
Pisquid	11.3	1.9	1980
Wiseners Pond	64.8	5.8	1980
Bouyer Creek (2 ponds)	5.5	1.9	1982
Ten Mile House	60.8	5.1	1982
Carraghers Pond	2.8	0.8	1983
Glenfinnan II	22.3	2.3	1985
Doyles Pond	6.1	1.6	1987
Warrens Pond	7.3	1.9	1987
Andrews Pond	4.1	1.9	1987

Table 10.1 Land Use Characteristics of Hydrometric Stations Located Within Hillsborough River Watershed Complex

Station Number	Drainage Area (km^2)	Forest Area (km^2)	Cleared Area (km^2)	Swamp Area (km^2)	Pond Area (km^2)	Basin Perimeter (km)	Total Length of Stream (km)	Stream Gradient (%)	Period of Record
01CC004	2.10	0.20	1.90	0.003	0.0	6.20	1.40	1.83	1976-1979
01CC005*	70.20	34.60	35.60	0.002	0.021	40.20	78.80	0.40	1988-PRESENT
01CC006*	27.20	4.80	22.40	0.03	0.004	22.10	22.60	0.57	1989-PRESENT

* ACTIVE

10.2 Charlottetown Area Regional Watercourse Improvement Project

Early planning for the now completed Charlottetown Airport Expansion resulted in the preparation of an Environmental District Plan for the Charlottetown area. From this plan arose the Charlottetown Area Regional Watercourse Improvement Project under the administration of the Charlottetown Area Regional Planning Board.

The objective of the Project has been to provide a measure of environmental management for the streams and stream banks within the environmental district (O'Brien, 1988). Active from 1982 to 1988, the Project has incorporated a number of independent but inter-related work phases (Maps 11L/3 and 11L/6). Major activity during the Project focused upon the following:

1. the salvage of merchantable wood along stream banks;
2. the removal of some obstructions from streams; and
3. the pre-commercial thinning of overcrowded areas adjacent to waterways.

The summary report for the project's activities for 1987 - 1988 is contained in Appendix C.

10.3 Clyde River Subwatershed Assessment

During the summer of 1988 an assessment was performed on the Clyde River subwatershed. It is part of the West River system, a major component of the Hillsborough River Watershed Complex. A report was subsequently produced under a contract between the Quebec Labrador Foundation/Atlantic Center for the Environment and Inland Waters Directorate, Environment Canada. The intent of the Clyde River assessment report is to act as a supplement to the watershed inventory report.

The assessment focuses upon the concept of integrated resource management and examines problems arising due to agricultural, forestry and road construction and maintenance practices within the Clyde River subwatershed. Land use practices during 1988 were determined and from which a map was derived delineating soil loss risk areas (Figure 10.1). Recommendations are also suggested for rectifying the problems encountered during fieldwork.

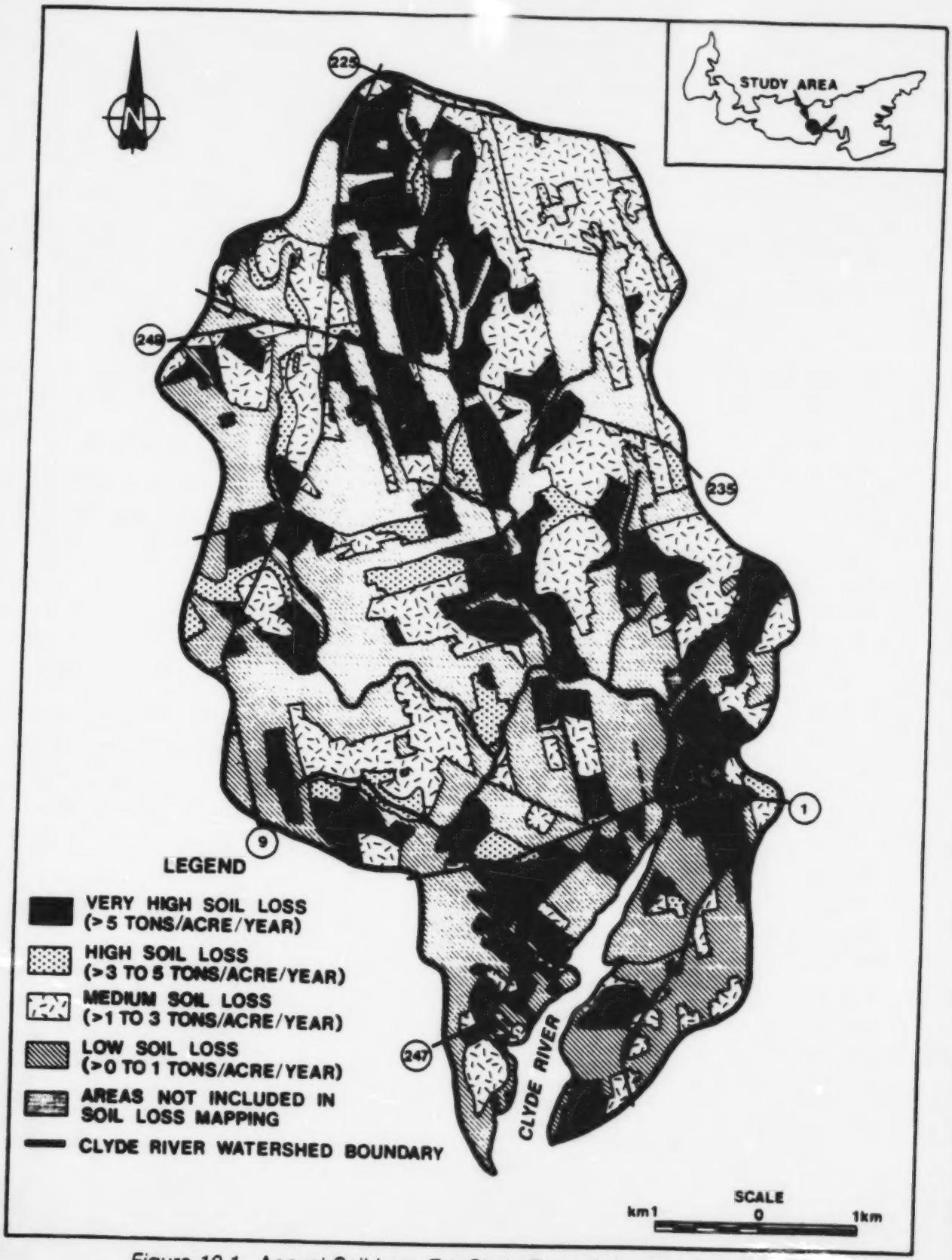

Figure 10.1 Annual Soil Loss For Clyde River Subwatershed (1988)

11.0 ACTIVITIES AFFECTING SURFACE WATER RESOURCES WITHIN HILLSBOROUGH RIVER WATERSHED COMPLEX

Many of the activities affecting surface water resources within the Hillsborough River Watershed Complex occur as a result of the high erodibility of Island soils. Soil erosion is accelerated by poor agricultural, forestry and road maintenance and construction practices. The problems affecting surface water resources on P.E.I. can be placed into three general categories: sedimentation (siltation) sources, pollution point sources and instream obstructions.

11.1 Sedimentation (Siltation) Sources

The entry of soil into surface waterways is described by the Watershed Inventory Project as a sedimentation (siltation) source. Autumn tillage, particularly plowing with the slope and cultivation excessively close to the streams' edge, often results in extensive landwash and siltation of the Island's waterways. Improper forestry operations, such as clearcutting on steep slopes and removal of greenbelts along streams and rivers also provides for sedimentation of streams and rivers.

One of the major sources of siltation to Island waterways is caused by the construction and maintenance of P.E.I. roads. Many roads on the Island are unpaved which presents numerous potential sources of sedimentation. Improper grading of these roads, in particular, leaving a ridge of clay and sand at either edge allows runoff water to form cannels causing erosion to the road surface. Water usually flows alongside these ridges until it "breaks" through, usually at a road-stream intersection. This practice of grading also renders ditches, if present, useless.

Silt-loading of Island streams and rivers does not usually affect the waterway at the point of entry but its effects are impacted further downstream. Soil particles are carried by currents and deposited in the stream covering essential finfish spawning areas. Shellfish beds in the estuaries are also adversely affected in that they are smothered by the silt that has originated from upstream locations.

11.1.1 North Wiltshire

An unnamed tributary of Quinns Brook flows directly through a beef feedlot operation in North Wiltshire (Map 11L/6). Housing some seventy (70) head of livestock, this operation contributes to sedimentation and fecal contamination of the receiving waterway as cattle are free to roam at will throughout several hundred metres of the

streambed.

11.1.2 St. Catherines

Cattle were observed watering on MacFadyens Creek in St. Catherines (Map 11L/3). Although the operation is relatively small, considerable bank erosion is evident.

11.1.3 Howards Creek

A stock watering location was observed on Howards Creek (Map 11L/3) in the North River subwatershed. Considerable bank erosion is evident.

11.1.4 Pisquid

A recent clearcut was noted on the south bank of an unnamed creek draining into the Pisquid River (Map 11L/7). Brush had been cut and piled and there is a considerable slope to the stream's edge. As such, the potential exists for continuing landwash if cover vegetation is not established.

11.1.5 Clyde River

This stock watering site, located just off Route #247 in Clyde River (Map 11L/3), exhibits extensive stream bank erosion and evidence of landwash.

11.1.6 Ellens Creek

This snow dumping site, located adjacent to North River Road in Charlottetown (Map 11L/6), is the source of runoff into Ellens Creek. There is much erosion evident, especially in the spring. The excessive entry of salt and other contaminants into the waterway can also affect the suitability of the nearby area as fish or shellfish habitat.

11.2 Pollution Point Sources

The entry of non-natural substances into a surface waterway is known as a pollution point source. For example, fertilizer and manure runoff into surface waterways results in bacterial and chemical contamination of the system. Inadequately or improperly treated human sewage, stormwater drainage and the discharge of industrial effluents also contribute to the deterioration of P.E.I.'s surface water quality.

The most recent examples of pollution point sources on the Island have been the entry of petroleum products, specifically gasoline, into streams, rivers and groundwater

aquifers. This has resulted from either transportation accidents or leakage from underground storage tanks.

In many cases, the result of this type of pollution is the eutrophication of the aquatic system. As is the case with siltation its effects are most often impacted downstream. This can result in the closure of shellfish harvesting areas.

11.2.1 Seaman's Beverages

Located in the West Royalty Industrial Park, Seaman's Beverages (Map 11L/6), a soft drink bottling company, discharges its pre-rinse and wash waters into Graham Rogers Lake. Water quality tests performed by the Environmental Management Division, P.E.I. Department of Community and Cultural Affairs has indicated that this discharge has a high BOD and fecal coliform count and contributes significantly to the eutrophication of the Lake (Reeves, 1988).

11.2.2 Riverbend Colonies

Riverbend Colonies is a privately-owned trailer court housing some ninety-six (96) mobile homes. The court is serviced by an on-site fill and draw sewage lagoon (Map 11L/6). Seepage to a nearby stream is occurring (Reeves, 1988).

11.2.3 North River Causeway

Insufficient exchange of water at the North River Causeway (Map 11L/6)) undoubtedly contributes to increased algal growth and subsequent eutrophication of Graham Rogers Lake, a high-use recreational area.

11.2.4 Red Rock Farms

Manure leachate from a poultry operation in Mount Herbert (Map 11L/3) is allowed to eventually enter a nearby stream. This pollution point source is a major reason for the closure of the Fullertons Marsh area for shellfish harvesting (Godfrey, 1988).

11.2.5 Stormwater Discharge

Effluent from a number of stormwater drainage systems flows, for the most part, unmonitored and untreated into the Hillsborough River Watershed Complex (refer to section 7.1). These discharges constitute both a bacterial and a chemical pollutant to the receiving waters.

11.2.6 Pisquid

Liquid manure from a feedlot operation (Map 11L/7) on the Pisquid River was noted to flow down a steep slope to enter the River and constitute a source of biological contamination. Animals, however, do not have direct access to the River.

11.2.7 Allisary

Runoff from a manure pile (Map 11L/7) is occurring. The manure is permitted to flow down a steep slope and enters Allisary Creek, a tributary of the Hillsborough River.

11.2.8 North Wiltshire

Quinns Brook, a tributary of the West River (Map 11L/6), flows through a beef feedlot operation in North Wiltshire thereby constituting a source of bacterial contamination to the waterway.

11.3 Instream Obstructions

Numerous other factors also influence the quality of Prince Edward Island's waterways. Fallen trees or other debris in the streams and rivers present problems for fish passage. Improperly installed culverts, insufficient water flow and non-existent or inadequate dam bypass structures not only pose barriers to successful fish passage but also affect the amount of water available for use in downstream areas by other proponents.

11.3.1 Balderstons Pond

The bypass channel of Balderstons Pond (Map 11L/6) in North Wiltshire is shallow with sections likely to be impassable for fish. Similarly, natural debris blocks other sections of the channel, especially near the road culvert of Highway #225.

11.3.2 Wiseners Pond

The earth embankment/dam at Wiseners Pond, a Ducks Unlimited project located in Watervale (Map 11I/7), constitutes a complete barrier to fish passage. The pond outlet has a 3.0 metre drop from the impoundment level to the stream level.

11.3.3 MacFaydens Creek

A road culvert, located at the intersection of MacFaydens

Creek and Route #9 (Map 11L/3) in St. Catherines, poses a barrier to fish passage. The 1.2 metre corrugated steel culvert is raised some 0.10 metres above stream level on the south side of Route #9. At the time of observation (mid-March) the water depths within the culvert and the downstream pool were 0.20 metres and 0.55 metres, respectively.

11.3.4 Dunedin

A 0.90 metre culvert, located at Route #247 near Dunedin (Map 11L/3), is positioned approximately 0.50 to 0.55 metres above stream level on the south side of the road. This culvert appears to pose a complete barrier to fish passage.

11.3.5 Coadys Creek

A 1.2 metre steel culvert draining a pond across Route #265 on Coadys Creek (Map 11L/3) presents a total barrier to fish migration. The upstream portion of the culvert is steeply sloped and split for about 5.0 metres. The pond water enters through the split rather than through the end of the culvert thus presenting two complete obstacles to fish passage.

11.3.6 Fergusons Creek

A 1.20 metre steel culvert, located at the intersection of Route #19 and Fergusons Creek near Rocky Point (Map 11L/3), has insufficient flow to enable successful fish passage. The downstream opening also has a 0.60 metre drop to stream level.

11.3.7 McKies Creek

A wooden culvert, incorporating a series of planks which blocks most of the flow and thereby creates a small pond, is located at the intersection of Route #19 and McKies Creek in Rocky Point (Map 11L/3), and presents a complete barrier to fish passage.

11.3.8 Pisquid I

A farm lane creates a small pond on a tributary of the Pisquid River (Map 11L/7) constituting a complete barrier to fish passage. The culvert opening on the upstream end is three-quarters blocked by sand-filled plastic bags and plywood. Essentially, the structure forms a "drop inlet" of 0.60 - 0.75 metres. A drop of similar magnitude from the downstream opening of the culvert constitutes another complete barrier. An unapproved dump site is located streamside and extensive washout has occurred around this derelict roadway culvert.

11.3.9 Pisquid II

A highway culvert over an unnamed tributary of the Pisquid River (Map 11L/7), constitutes a complete barrier to the passage of at least some fish species. Large numbers of migrating smelt were observed below the barrier. None were noted upstream of the culvert. However, the relatively low stream-to-culvert jump would not block the passage of salmonid species.

REFERENCES

Aitken, A., Department of Fisheries and Oceans, Charlottetown, 1988.

Brown, I., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Campbell, K., I. Judson, and K. MacWilliams, Report on Estuarine Resource Inventory Survey of North (Yorke) River, P.E.I., 1972.

Canada Land Inventory, Soil Capability for Agriculture, 1968.
Canadian Wildlife Service, Wetlands Atlas of Prince Edward Island, n.d.

Clough, K., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Curley, K., Air and Solid Wastes Management Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Dibblee, R., Biologist, Fish and Wildlife Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Dickieson, W., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Godfrey, A., Biologist, Fish and Wildlife Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

The Guardian - Patriot, Charlottetown, September 1, 1988.

Hiscock, A., Environment Canada, Charlottetown, pers. comm., 1989.

Horne, F., S. Knudson, A. Rice, and C. Roumbanis, 1988 Scenic Heritage Roads Program - Final Report, Island Nature Trust, Charlottetown, 1988.

Hume, D., Charlottetown Yacht Club, Charlottetown, pers. comm., 1988.

Hurry, N., Chief Conservation Officer, Fish and Wildlife Branch, P.E.I. Department of Community and Cultural Affairs, pers. comm., 1988.

Jenkins, K., P.E.I. Development Agency, Charlottetown, pers. comm., 1988.

Jenkins, P., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Lea, J., Maritime Electric Company Limited, Charlottetown, pers. comm., 1988.

MacLean, S., Director of Water Safety, Canadian Red Cross Society, Charlottetown, pers. comm., 1989.

MacWilliams, K. and I. Judson, Estuarine Resource Inventory : East (Hillsborough) River Prince Edward Island, 1973.

McDermott, M., Maritime Electric Company Limited, Charlottetown, pers. comm., 1988.

McInnes, M., Emergency Measures Organization, P.E.I. Department of Community and Cultural Affairs, Summerside, pers. comm., 1988.

McInnis, R., Department of Fisheries and Oceans, Charlottetown, pers. comm., 1988.

Morrison, A., Department of Fisheries and Oceans, Charlottetown, pers. comm., 1988.

Murphy, C., Environmental Management Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Murphy, S., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

Newson, J., P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1988.

O'Brien, T., Project Manager, Charlottetown Area Regional Watercourse Improvement Project, Charlottetown, pers. comm., 1988.

O'Connell, D., Diagnostic Chemicals, Charlottetown, pers. comm., 1988.

P.E.I. Department of Tourism and Parks, Angling on Prince Edward Island, 1988.

P.E.I. Department of Tourism and Parks, Canoeing on Prince Edward Island, n.d.

P.E.I. Department of Tourism and Parks, 1988 Visitors Guide, 1988.

Reeves, D., Environmental Management Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Small, D., Department of Fisheries and Oceans, Ellerslie, pers. comm., 1988.

Stewart, G., Environmental Management Branch, P.E.I. Department of Community and Cultural Affairs, Charlottetown, pers. comm., 1988.

Taylor, K., Inland Waters Directorate, Environment Canada, Dartmouth, N.S., 1988.

Van Omme, H., Charlottetown Area Pollution Control Centre, Charlottetown, pers. comm., 1988.

Veer, C., Soil Specialist, P.E.I. Department of Agriculture, Charlottetown, pers. comm., 1989.

Water Resources Branch, P.E.I. Department of Community and Cultural Affairs, Prince Edward Island Active and Abandoned Waste Disposal Site Survey - Phase I, Charlottetown, 1983.

APPENDICES

Water Resources Branch
11 Kent Street, 3rd Floor
Box 2000 Charlottetown P.E.I. C1A 7N8
892-0311

Chem. Lab. No. 9430

Bact. Lab. No. 2574

WATER QUALITY REPORT

PLEASE PRINT CLEARLY

1. Collected By: Surface Water Division Reference: _____ Date July 12 1988 Time 12:00
2. Owner _____
   Well Address _____ Phone _____
3. Person to whom results should be sent:
   Name F Pollard / D Reeves
   Mailing Address Fish & Wildlife
   892-0311 (Ext 277) Postal Code: _____
4. Reason for analysis: Drinking water surface H2O
5. Source of Supply: Public ☐ Private ☑ Swimming Hole upstream
   Other (Specify) _____
6. Sampling Point: Tap ☐ Pump ☐ Other (Specify) Water in Yellow Pail
7. Well Information: Driller _____ Date _____ 19____
   Location of Well: Under Front Step ☐ Inside Basement ☐
   Outside Basement ☐ Pit ☐ Pitless ☐
   Other (Specify) _____
   Particulars of Well: Diameter _____ cm, Depth _____ m
   Casing Length _____ m
   Casing Type: Steel ☐ Plastic ☐ Other (Specify) _____
8. Water Level _____ m below top of casing.
9. Other Information (Previous samples, field notes, etc.) _____

COMMUNITY SERVICES LAB
BACTERIAL ANALYSIS

DILUTION	10ml	1.0ml	0.1ml
24 Hours			
48 Hours			
Confirmation			

Total Coliform 240 + MPN

(M.F. Count or M.P.N. per 100 ml)

Faecal Coliform 240 + MPN

Examiner _____

CHEMICAL ANALYSIS (mg/L)

1. Total dissolved solids _____
2. Total iron _____
3. Chloride _____
4. Total Hardness _____
5. Nitrates (NO_3-N) _____
6. Other _____
   Date received from lab _____
   Chemist _____

TO PROPERLY EVALUATE WATER QUALITY IT IS IMPORTANT THAT THE ABOVE INFORMATION BE AS COMPLETE AS POSSIBLE.

COMMENTS (Dept Use Only): See Reverse Side For Water Quality Interpretation.

RECEIVED
JUL 22 1988
FISH & WILDLIFE DIVISION

Date July 20 1988

Alan Robson
WATER RESOURCES SECTION

Chem. Lab. No. 9431

Water Resources Branch
11 Kent Street, 3rd Floor
Box 2000 Charlottetown P.E.I. C1A 7N8
892-0311

Bact. Lab. No. 2573

WATER QUALITY REPORT

PLEASE PRINT CLEARLY

1. Collected By: [illegible] Reference: _____
2. Owner _____
   Well Address _____ Phone _____
3. Person to whom results should be sent:
   Name E Patterson / D Reeves
   Mailing Address Eldon Hill
   902-621 (227) Postal Code: _____
4. Reason for analysis: [illegible]
5. Source of Supply: Public ☐ Private ☐
   Other (Specify) SEAMAN'S Rev. Downstream
6. Sampling Point: Tap ☐ Pump ☐ Other (Specify) outlet to Graham Rogers Lake
7. Well Information: Driller _____ Date _____ 19____
   Location of Well Under Front Step ☐ Inside Basement ☐
   Outside Basement ☐ Pit ☐ Pitless ☐
   Other (Specify) _____
   Particulars of Well: Diameter _____ cm, Depth _____ m
   Casing Length _____ m
   Casing Type: Steel ☐ Plastic ☐ Other (Specify) _____
8. Water Level _____ m below top of casing.
9. Other Information (Previous samples, field notes, etc.) _____

Date Jul 12 19 88 Time [illegible]

COMMUNITY SERVICES LAB
BACTERIAL ANALYSIS

DILUTION	10ml	1.0ml	0.1ml
24 Hours			
48 Hours			
Confirmation			

Total Coliform 95 M.P.N
(M.F. Count or M.P.N. per 100 ml)
Faecal Coliform 23 M.P.N
Examiner PF

CHEMICAL ANALYSIS (mg/L)

1. Total dissolved solids _____
2. Total iron _____
3. Chloride _____
4. Total Hardness _____
5. Nitrates (NO_3-N) _____
6. Other _____
   Date received from lab _____
   Chemist _____

TO PROPERLY EVALUATE WATER QUALITY IT IS IMPORTANT THAT THE ABOVE INFORMATION BE AS COMPLETE AS POSSIBLE.

COMMENTS (Dept Use Only): See Reverse Side For Water Quality Interpretation.

RECEIVED
JUL 22 1988
FISH & WILDLIFE DIVISION

Date July 20, 19 88

Alan Robinson

APPENDIX B

HILLSBOROUGH RIVER SUBWATERSHED DAM INSPECTIONS

Location	Condition/Remarks	UTM Coordinates
Mount Herbert	By-pass pond, outlet blocked by debris.	495900 - 5120900
Johnstons River Impoundment	5-step Denil fishway, stoplog water control structure.	500200 - 5124300
Brazels Pond	Breached, culverts are still in channel.	502200 - 5122700
Reardons Pond I	4-step pool and weir	505900 - 5122900
Reardons Pond II	5-step pool and weir	506300 - 5122900
Jenkins Pond I	2-step pool and weir	505700 - 5122400
Jenkins Pond II	6-step pool and weir	505900 - 5122500
Callaghans Pond	By-pass pond	509600 - 5127000
Bethel I	By-pass pond	502200 - 5120900
Bethel II	By-pass pond	502100 - 5120800
Leards Pond	Denied access by landowner.	512700 - 5129200
Warrens Pond	5-step pool and weir	514200 - 5134700
Doyles Pond	Drop inlet, complete barrier to fish.	509600 - 5135000
Dromore I	8-step pool and weir	512800 - 5125800
Ings Pond	Farm lane, culvert	498200 - 5117900
Fullertons March Creek	Farm pond, culvert	496000 - 5117800
Unnamed Pond and Creek	By-pass pond	499600 - 5120300
Stevart Cove	Dyke separating Stevart Cove from inlet emptying into Hatchery Pond.	491700 - 5117900
Hatchery Pond	Dyke	492300 - 5117800
Private Pond near Southport Park	Dyke, culvert (driveway)	492800 - 5117900

Location	Condition/Remarks	UTM Coordinates
Wrights Creek	Not checked	491100 - 5125000
East Royalty I	Marsh area, not fish habitat.	492200 - 5125000
East Royalty II	Small pond which flows into a wet meadow, fish passage not likely.	493400 - 5125700
Hornes Creek III	Farm lane culvert, no visible stream.	494100 - 5127500
Nornes Creek IV	Snow covered	493700 - 5128000
Suffolk Station	Farm pond, complete barrier.	496800 - 5127100
Millers Creek I	Small pond with shallow outlet, passage of fish unlikely.	498200 - 5130600
Jays Brook II (Warrens Pond)	Breached	515100 - 5134500
Jays Brook III (Head of Hillsborough)	1.20 metre culvert, no barrier to fish, natural debris and an abandoned vehicle are in stream.	517700 - 5133800
Jays Brook IV	Breached	518100 - 5131200
Jays Brook V (Fanning Brook)	Breached	513300 - 5131700
Douglas Pond	Beaver flowage, not fish habitat.	513800 - 5126200
Near Leards Pond	Culvert split (0.15 metre gap), 0.60-0.76 metre drop on d/s side, u/s side blocked by bags of clay and plywood boards.	512000 - 5129300
Wiseners Pond	DU pond, complete barrier to fish, drop inlet.	508800 - 5123200
Jenkins Pond III	Culvert, feeder stream, not suitable fish habitat above roadway.	505900 - 5120900
Jenkins Pond IV	2.5 metre culvert, water level exceeds height of culvert.	506400 - 5121800
Jenkins Pond V	5-step pool and weir	506700 - 5121200
Fort Augustus I	Not checked	504700 - 5129500

Location	Condition/Remarks	UTM Coordinates
Fort Augustus II	By-pass pond with outlet blocked by natural debris, partial barrier to fish	504900 - 5128800
Mermaid	Breached, no barrier to fish.	496800 - 5123100
Jays Pond	Road crossing	509000 - 4130500
Charles Pond	Road crossing	508300 - 5126500
Millers Creek II	5-step pool and veir	509900 - 5129300
Hornes Creek I	4-step pool and veir	494500 - 5125500
Hornes Creek II	3-step pool and veir	494000 - 5126500
Fullertons Creek I	Small pond with side outlet, possible barrier during lov vater levels, heavy silting from adjacent field.	495900 - 5119000
Fullertons Creek II	Breached	497300 - 5119300
Fullertons Creek III	By-pass pond	497700 - 5118900
Fullertons Creek IV	Wooden box culvert under railraod tracks 24-30 metres in length, not a barrier but it may soon collapse and form one.	497800 - 5118800
Fullertons Creek V	2 - 0.45 metre culverts on farm lane, erosion evident, no barrier to fish passage.	498100 - 5118600
Fullertons Creek VI	Farm lane, culvert (0.90 metre), no barrier to fish, good vater flov.	498500 - 5118700
Fullertons Creek VII	By-pass pond, no barrier to fish passage.	499500 - 5118500
Fullertons Creek VIII	Pond formed by railroad, several partial barriers due to deadfall, most of stream is without cover.	500000 - 5118100
Bouyer Creek I	Railroad crossing, small pond d/s with bypass outlet toward North River which appears to be breached, fish passage is likely up to pond.	494800 - 5120300

Location	Condition/Remarks	UTM Coordinates
Bouyer Creek II	By-pass pond, barrier to fish even though pond is posted "Fishing - 12 and under only".	494800 - 5120200
Bouyer Creek III	Not checked	494800 - 5119900

WEST RIVER SUBWATERSHED DAM INSPECTIONS

Location	Condition/Remarks	UTM Coordinates
McKies Creek	Complete barrier to fish due to both debris and type of structure (road crossing).	482800 - 5117200
Ferguson Creek	Road crossing (1.20 metre culvert) complete barrier to fish on north side due to lov water level within culvert.	486800 - 5114700
Black Creek	Road crossing	483200 - 5112600
McLeods Creek	No problem	478100 - 5114000
Maclaughlins Creek	Small pond in pasture/hayland; stream is very small and probably not great fish habitat (partial barrier.	476300 - 5113800
MacFadyens Creek	1.20 metre culvert with aproximately 0.20 metre water depth (Feb. 23/88) in culvert.	476200 - 5115700
Unnamed Creek near Bonshaw	Driveway culvert on beef operation.	472600 - 5115200
Unnamed Creek near Green Raod	Not checked	471300 - 5117000
Crosby's Mill Pond	By-pass pond	472600 - 5116800
Unnamed Pond near Churchill	Very small, very little water flov; complete barrier.	473800 - 5116800

Location	Condition/Remarks	UTM Coordinates
Unnamed Creek near New Haven	Dyke - 0.75 metre culvert - depth 0.10 metre; stream depth 0.12 metre - complete barrier due to water depth and debris.	476300 - 5117700
MacPhees Creek	East - 4' box culvert; stream depth (0.45 metre), culvert water depth (0.15-0.30 metres). West - culvert H_2O depth (0.05 metre); 0.10 metre drop to stream.	477700 - 5117100
Unnamed Pond near Dunedin	Complete barrier, 0.90 metre culvert (metal) South side of road - stream depth 0.05-0.06 metre; stream bottom to bottom of culvert (0.06 metres).	478400 - 5116600
MacEachern's Creek	Nothing located after extensive search.	481100 - 5115500
Meadow Brook Pond	Complete barrier, metal culvert split - very little water flowing through culvert.	481700 - 5116100
Hydes Pond	3-step pool and vrir fishway	483500 - 5118600
East Wiltshire Pond (dugout)	Not checked	483400 - 5121300
Clyde River I	6 baffles in road crossing structure (2.0 metre arched culvert).	479800 - 5120200
Clyde River II	6 baffles in road crossing structure (2.0 metre arched culvert).	479400 - 5120900
Pond near Elmwood	Not checked	477200 - 5120900
Kingston I	Snow covered but there was a pond upstream which would be a complete barrier.	476900 - 5122000
Kingston II	Not checked	476900 - 5122600
New Haven	Not checked	478000 - 5119000

Location	Condition/Remarks	UTM Coordinates
Willis Pond near Kingston	By-pass pond	478700 - 5123200
Kingston III	No obstruction to fish; 0.20 metre water in approximately 1.20 metre steel culvert; pool depth 0.40 metre.	479700 - 5122900
Hampshire I	Not checked	478000 - 5124500
Hampshire II	By-pass pond in middle to pasture (no cover), stable banks no evidence of stock watering.	478300 - 5124600
Hampshire III	Not checked	477900 - 4124600
North Wiltshire I	Snov covered-complete barrier in nearby pond (no visible channel).	476300 - 5126400
Balderstons Pond	By-pass pond - complete barrier at outlet channel (not enough water); road crossing (1.20 metre culvert) is complete barrier.	474100 - 5127600
Carraghers Pond	5-step pool and veir fishvay and vater control structure.	473300 - 5125700
Brookvale	North side of road: Pond is small, shallov flooded area (complete barrier); possible cattle area, (culvert not seen because of snov cover). South side of road: 0.90 metre metal culvert; 0.50 metre pool depth; 0.35 metre from pool surface to bottom of culvert; culvert vater depth (0.08 metre).	469400 - 5125900

NORTH RIVER SUBVATERSHED DAM INSPECTIONS

Location	Condition/Remarks	UTM Coordinates
Howards Creek I	Metal culvert allovs water to by-pass at one end. Abandoned cars line one edge of dyke.	486200 - 5120900

Location	Condition/Remarks	UTM Coordinates
Howards Creek II	Concrete culvert allows water to pass through dam.	485800 - 5120700
Pumping Station I	By-pass pond	488300 - 5123900
Pumping Station II	By-pass pond	488400 - 5124100
Coles Creek I	By-pass pond	488500 - 5129800
Coles Creek II	By-pass pond	485600 - 5130300
Coles Creek III	By-pass pond	485500 - 5130700
Coles Pond	Not checked	484400 - 5127400
Moores Pond	Not checked	485300 - 5124800
Warrens Pond	By-pass pond	483400 - 5123900

APPENDIX C

CARSIP IV

SUMMARY REPORT

Timothy O'Brien
Project Manager

March 20, 1988

FINAL REPORT

This report is a summary of the Charlottetown Area Regional Streambank Improvement Project IV (CARSIP IV) for the period of 1987-1988. This year's project was made possible through a $66,000 Federal Employment and Immigration Canada Job Development grant and the cooperative efforts of the Provincial Department of Energy & Forestry and the Canadian Forestry Service.

This year's project, as with previous years' work, was designed to serve a two-fold objective. First, the employment was to provide practical work-related experience for a period of 15 weeks for 7 employees who had been unemployed 24 of the past 30 weeks and had no previous training in silvicultural related work. Second, under the guidance of project staff and in cooperation with the various property owners and municipalities of the area, improvements were able to be made to the stream and streambanks within the Environmental District of Charlottetown.

The first phase of the project involved a 10 day training period put on by Mr. Barrie Bain from the Renevable Resources Department of Holland College. The purpose of the training was to instruct the employees in the safe and efficient use of a chainsav and to teach basic silvicultural techniques used in managing forested areas.

The classroom instruction period was supplemented with field trips for the purposes of species identification and to illustrate the effects of sound forest management, as demonstrated on the P.E.I. Energy and Forestry demonstration woodlots.

One day of the training involved the students in an Emergency First Aid Clinic conducted by staff of the Canadian Red Cross Society. Students were taught proper bandaging, reaction to crisis situations, artificial resuscitation and splinting.

Following the classroom instruction there was a 5 day practicum where the students were given the opportunity to practice some of the techniques they had been exposed to in the classroom, in a controlled environment. During this session each student received individualized attention from both the instructor and senior project staff. Outlined in Table 1 is an indexed listing of the skills each of the students were exposed to and had the opportunity to practice.

The CARSIP IV project this year was targeted on improvements in Hyde Creek in Cornvall and Scotts Creek in Marshfield. An assessment of each site prior to beginning work indicated a need for salvaging of standing deadwood, thinning of dense areas of regeneration and the removal of debris and other objects from the waterways.

Table 1: Client training schedule as completed by Mr. Barrie Bain, Holland College for CARSIP IV Project.

Training Information	Training Days
Introduction	
Chainsaws - Basic Operation - Knotching - Felling - Limbing - Safety - Troubleshooting - Maintenance & Repair - Tools & Accessories	1
- Review on Chainsaws	1
Harvesting - Work layout - Assess & prepare felling site - Product specifications - Extraction systems - Difficult situations	1
Silviculture - Terminology - Softwood vs. hardwood - Tree selection - Tree species - Pre-commercial thinning - Commercial thinning	1
- Field trip; tree identification	1
- Various types of operations; application of theory and practical skills learned in class	10

By project end 24 properties had come under management, 2.2 miles of streambank had been improved and 36 acres of buffer-strip areas had been treated (Table 2). The width of the buffer-strip identified for each property was dependent upon the steepness of the streambank, and the condition and quantity of the forested area. Buffer-strip width varied from 15 to 100 feet with the median being 40 feet.

The 16 weeks of work for the CARSIP project was divided amongst the training programs 3 weeks and the community of Cornvall and Marshfield, 6 and 7 weeks respectively. The financial distribution based on the number of weeks spent at each community in proportion to the total contract value of 66,000 dollars would be approximately 28,875 dollars for Marshfield or 44 percent, and 24,750 dollars for Cornvall or 38 percent. Highlighted in Table 3 is a listing of total expenditures for the Project.

The most significant vork completed during the project, in terms of its impact on the surrounding area, vas within the properties owned by the Province of P.E.I. and the Municipality of Cornvall adjacent to the lagoon on the Hyde Creek. This site, prior to CARSIP treatment, vas stagnating from excessive crovding and vas aesthetically unattractive.

Recommended for each site vas a pre-commercial thinning designed to reduce the groving stock level from its present level of 6000 trees/acre to a density of 900 trees/acre. This area should respond vell to this treatment due to the fact that the remaining forest cover is healthy and contains a mixture of desirable hardvood and softvood species. With a minimum of community support these sites could be developed for multi-use purposes including nature and interpretive

Table 2 CARSIP IV FINAL REPORT

	CARSIP IV	TOTAL ALL PROJECTS
1. Properties Completed (No.)	24	111
2. Streambanks & Improved (Mi.)	2.2	25.8
3. Acres Improved (No.)	36	297
4. Trees Planted (No.)	-	61,000
5. Acres Planted (No.)	-	68
6. Work Weeks (No.)	154	2,257
7. People Employed (No.)	10	81
8. Gross Project Value ($)	68,000	929,000

Table 3.

CARSIP IV

COST CONTROL ESTIMATE

NOV. 23 - MARCH 18

WEEK 17 OF 17

	Budget		Spent to Date		Forecast to End of Project	
Employee Benefits	4,323		4,106		4,106	
Equipment Rental	4,500		4,330		4,330	
Mileage	)		1,974	)	1,974	)
Materials & Supplies	) 6,500		2,519	) 6,605	2,519	) 6,605
Safety Equipment	)		2,012	)	2,519	)
Insurance	)		100	)	100	)
Training	5,735		4,860		4,860	
TOTAL	21,055		19,901		19,901	
Less:						
Employee Deductions	-		830		830	
TOTAL	21,055		19,071		19,071	

trains or recreation involving cross-country skiing and boating on the lagoon.

The completion of CARSIP IV brings to 111 the number of properties that have received silvicultural treatments, dating back to 1983. Many of these property owners, as a result of this work, have now applied for and are receiving forest management incentives under the Forest Resource Development Agreement (FRDA). To date 25.8 miles of streams have been improved, 297 acres of forested bufferstrips treated over 61,000 trees planted within the Charlottetown area. (Table 4).

Recommendations for future work include the maintenance of all areas reforested during the periods 1983-1985. For these sites to have any impact on the environmental quality of the surrounding area they must be maintained and permitted to grow free of competition. Without a maintenance program these plantations will fail offsetting any future potential. In addition, all sites treated by CARSIP projects since 1985 should be reforested to help off-set any erosion which may occur as a result of the harvesting of areas adjacent to waterways.

Table 4.

CHARLOTTETOWN AREA REGIONAL STREAMBANK IMPROVEMENT PROJECT

SUMMARY OF PROGRESS

MARCH 1988

	PROPERTIES COMPLETED	STREAMBANK IMPROVED (Miles)	NUMBER OF ACRES IMPROVED	TREES PLANTED (No.)	ACRES PLANTED Acres	WORK WEEKS (No.)	NO. OF PEOPLE EMPLOYED	GROSS PROJECT VALUE ($)
82&83 Projects (Jointly with Energy & Forestry)								
Figures include work completed on the following sites.								
Royalty Oaks E. Royalty Landfill Beach Grove — 33 acres* completed	20	7.3	100	21 000	31	855	7-16	400 000
CARSIP (May 22-Nov.16, 1984)	35	8.3	80	35 000	30	443	17	170 000
CARSIP I (Feb. 18-Aug.23, 1985)	10	3.8	30	5 000	7	467	18	150 000
CARSIP II (Dec.2/85-Mar.21/86)	2	2.3	18	..	-	160	10	61 000
CARSIP III (Dec.1/86-Apr.3/87)	20	1.9	33	-	-	178	10	80 000
CARSIP IV (Nov.23/87-Mar.18/88)	24	2.2	36	-	-	154	10	68 000
TOTALS	111	25.8	297	61 000	68	2 257	81	929 000